Before the

FEDERAL COMMUNICATIONS COMMISSION

Washington, D.C. 20554

In the Matter of	)	
	)	
Amendment of Part 97 of the Commission's Rules To Implement WRC-03 Regulations Applicable to Requirements for Operator Licenses in the Amateur Radio Service	)	WT Docket No. 05-235
	)	RM-10781, RM-10782, RM-10783, RM-10784, RM-10785, RM-10786, RM-10787, RM-10805, RM-10806, RM-10807, RM-10808, RM-10809, RM-10810, RM-10811, RM-10867, RM-10868, RM-10869, RM-10870

To: The Commission

REPLY COMMENTS, BY JAMES K. BOOMER (October 13, 2005)

The following *reply comments* are submitted regarding *Notice of Proposed Rule Making* (The Notice), FCC 05-143A1, WT Docket No. 05-235 released on July 19, 2005.

These *reply comments* address Mr. James Perryman's October 12, 2005 *comment*.

Amateur Radio Population

The facts simply do not support the contention that elimination of the Morse code requirement would increase the number of radio amateurs.

Indeed, the amateur radio licensee statistics (http://ah0a.org/FCC/Licenses.html) referenced in the NPRM show that as of August 1, 2005, the radio amateur population has decreased 2.5% since April 2000, when the FCC substantially reduced the Morse code requirements to 5WPM. Additionally, no one has produced any substantive data to support the claim that the amateur radio population would increase if the Morse code licensing requirements were removed.

Digital Modes

In the fourth paragraph of his *comments*, Mr. Perryman states: "Many of the Digital Modes currently in active use can achieve 100% accurate copy at levels approaching 23dB below the ambient noise floor." This statement is meaningless without specifying bandwidth. Indeed, no communication system can operate satisfactorily with a negative decibel signal-to-noise ratio (S/N) in its information bandwidth—signal energy is required.

For example, a PSK31 signal has an information bandwidth of 31Hz. Further, convolutional coded QPSK PSK31, which is used for improved performance in a fading environment, requires a S/N of approximately 9.2dB in its information bandwidth (assuming 1dB implementation loss) for a bit error rate (BER) of 10^{-3}. A BER of 10^{-3} is considered the maximum allowable for reliable digital communications. Now, if this PSK system is connected to a receiver with, say, a 3kHz i.f. bandwidth, the carrier-to-noise ratio (C/N) ahead of the product detector (pre-detection C/N) is -10.66dB ($9.2 - 10\log_{10}(3{,}000/31) = -10.66$dB). *But, the decibel S/N is not negative in the system's information bandwidth*; it is +9.2dB.

It is well known that trained Morse operators can decode 5WPM messages at a 3dB signal-plus-noise-to-noise ratio [(S+N)/N], (0dB S/N) in a 100Hz bandwidth[1]. In fact, these operators can decode 5WPM Morse code at a 0dB S/N in bandwidths both wider and narrower than 100Hz.

The information bandwidth of a Morse code signal sent at 5WPM by a transmitter, with keying rise and fall times of approximately 35 milliseconds, is 12Hz in a non-fading environment, and 20Hz in a fading environment (ref. ARRL Handbook CD, Version 4.0, page 12.18, Figure 12.21).

We achieve maximum performance by matching the detection bandwidth to the signal's information bandwidth. The PSK31 system's digital demodulator accomplishes this, whereas with 5WPM Morse code, we add a 20Hz electronic post-detection bandpass filter, which matches its information bandwidth. These filters are in wide use among radio amateurs.

Signal-to-noise power density ratio (S/N_o)—i.e. S/N in one Hertz of bandwidth--is one convenient way to compare communication systems with matched filter demodulation systems. Thus coded QPSK PSK31 requires an S/N_o of 24.11dB ($9.2+10\log_{10}31 = 24.11$dB), whereas 5WPM Morse code with a 20Hz post-detection bandpass filter requires an S/N_o of 13.01dB ($0+10\log_{10}20 = 13.01$dB). Hence, a 5WPM Morse code system has an 11.1dB advantage over coded QPSK PSK31 ($13.01-24.11 = -11.1$dB). This means that 5WPM Morse code provides connectivity with 11.1dB less receiver antenna input signal power than a coded QPSK PSK31 system. In addition, it is a simpler system that requires less total hardware.

Morse code operators also provide adaptive communications by repeating characters to further improve communications reliability.

Clearly, Morse code systems are simple, and will provide life-saving communications, enabling amateur radio to fully comply with the emergency communications provisions of Part 97, Sections 97.1, 97.3, and 97.4 of the Commission's Rules:

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[1] See 09/20/05 James K. Boomer *Reply to Comments* for details

From Sec. 97.1 Basis and purpose:

"The rules and regulations in this part are designed to provide an amateur radio service having a fundamental purpose as expressed in the following principles:

(a) Recognition and enhancement of the value of the amateur service to the public as a voluntary noncommercial communication service, **particularly with respect to providing emergency communications** (emphasis added)."

James K. Boomer Credentials

- Licensed radio amateur since February 1947 (current call is W9UJ)
- Electronics Engineer, BSEE (Major in Communications Electronics), 1954 from the University of Nebraska
- Radio Design Engineer, Collins Radio Company, Cedar Rapids, Iowa, 1954
- Jet Fighter Pilot, Instructor Pilot, and Communications Officer, U.S. Air Force, 1954-1957 (leave of absence from Collins Radio Company for military service)
- Radio and Communication Systems Design Engineer, Staff Engineer and Project Engineer (including project engineer on the 62S-1 VHF converter for the Collins HF "S-Line"), Collins Radio Company, Cedar Rapids, Iowa, 1957-1964
- Communication Systems Design Engineer and Project Engineer for National Cash Register Company, Dayton, Ohio, 1964 to 1966
- Communication Systems Staff Engineer, Design Engineer, Project Engineer, and Engineering Section Manager at Magnavox Company (now Raytheon), 1966-1974
- Communication Systems Senior Marketing Product Manager at Magnavox Company (now Raytheon), 1974-2000—Retired in 2000.